

09/529401

Rec'd PCT/PTO 19 APR 2000

<b>TRANSMITTAL LETTER TO THE UNITED STATES</b> • <b>DESIGNATED / ELECTED OFFICE (DO/EO/US)</b> • <b>CONCERNING A FILING UNDER 35 U.S.C. 371</b>		ATTORNEY'S DOCKET NUMBER <b>P65317US0</b> <b>09/529401</b>
INTERNATIONAL APPLICATION NO <b>PCT/SE98/01906</b>	INTERNATIONAL FILING DATE <b>21 October 1998</b>	PRIORITY DATE CLAIMED <b>22 October 1997</b>
TITLE OF INVENTION <b>DISPLAY DEVICE</b>		
APPLICANT(S) FOR DO/EO/US <b>Lars ANDERSSON</b>		

**Applicant herein submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.**

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for Internatl. Preliminary Examination was made by the 19th month from earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☒ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the Internatl. Preliminary Examination report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11. to 16. below concern other document(s) or information included:**

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.  
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:

International Search Report — Swedish Patent Office  
PCT Request Form  
PCT/IB/304 Form  
PCT/IB/308 Form  
First Page of Publication  
Demand  
International Preliminary Examination Report — with Annexes  
Small Entity Declaration

US APPLICATION NO (if known, see 37 CFR 1.5) <div style="font-size: 1.5em; font-weight: bold;">09/509401</div>		INTERNATIONAL APPLICATION NO <div style="font-weight: bold;">PCT/SE98/01906</div>		ATTORNEY'S DOCKET NUMBER <div style="font-weight: bold;">P65317US0</div>	
17. <input checked="" type="checkbox"/> The following fees are submitted:  <b>Basic National Fee (37 CFR 1.492(a)(1)-(5)):</b> Internatl. prelim. examination fee paid to USPTO (37 CFR 1.492 (a) (1)) .. \$670.00 No international preliminary examination fee paid to USPTO (37 CFR 1.492 (a) (2)) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) .. \$760.00 Neither international preliminary examination fee (37 CFR 1.492 (a) (3)) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO) ..... <b>\$970.00</b> International preliminary examination fee paid to USPTO (37 CFR 1.492 (a) (4)) and all claims satisfied provisions of PCT Article 33(2)-(4) ..... \$96.00 Search Report prepared by the EPO or JPO (37 CFR 1.492 (a) (5)) ..... <b>\$840.00</b> <div style="text-align: right;"><b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b></div>				CALCULATIONS          \$ 970.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
<b>Claims</b>	<b>Number Filed</b>	<b>Number Extra</b>	<b>Rate</b>		
Total Claims	6 - 20 =	-0-	x \$18.00	\$	
Independent Claims	1 - 3 =	-0-	x \$78.00	\$	
Multiple Dependent Claim(s) (if applicable)			+ \$260.00	\$	
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$ 970.00	
Reduction by 1/2 for filing by <b>small entity</b> , if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				\$ 485.00	
<b>SUBTOTAL =</b>				\$ 485.00	
Processing fee of \$130 for furnishing the <b>English translation</b> later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f))				\$	
<b>TOTAL NATIONAL FEE =</b>				\$ 485.00	
Fee of \$40.00 for recording the enclosed <b>assignment</b> (37 CFR 1.21(h)). Assignment must be accompanied by appropriate cover sheet (37 CFR 3.28, 3.31).				\$	
<b>TOTAL FEES ENCLOSED =</b>				\$ 485.00	
				Amt. to be refunded:	\$
				Amt. charged:	\$
a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>485.00</u> to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. <b>06-1358</b> in the amount of \$ <u>---</u> to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge my account any additional fees set forth in §1.492 during the pendency of this application, or credit any overpayment to Deposit Account No. <b>06-1358</b> . A duplicate copy of this sheet is enclosed.					
<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p style="margin: 0;"><b>SEND ALL CORRESPONDENCE TO:</b></p> <p style="margin: 0;"><b>Jacobson, Price, Holman &amp; Stern, PLLC</b></p> <p style="margin: 0;">400 7th Street, N.W., Suite 600</p> <p style="margin: 0;">Washington, DC 20004</p> <p style="margin: 0;">202-638-6666</p> <p style="margin: 0;"><b>CUSTOMER NUMBER: 00136</b></p> </div> <div style="width: 35%; text-align: center;"> <p style="margin: 0;">By </p> <p style="margin: 0;">John C. Holman</p> <p style="margin: 0;">Reg. No. 22,769</p> </div> </div>					

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Lars ANDERSSON

Serial No.: New

Filed: April 19, 2000

For: DISPLAY DEVICE

PRELIMINARY AMENDMENT TO LESSEN FEESAssistant Commissioner of Patents  
Washington, D.C. 20231

Sir:

Prior to initial examination, please amend the above-identified application as follows:

IN THE CLAIMS

Claim 1, line 18-19, delete "of lacquer over the complete sheet-like support";

Claim 6, line 1, delete "and 2".

REMARKS

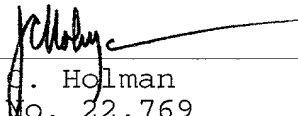
The foregoing Preliminary Amendment is requested in order to delete the multiple dependent claim and avoid paying the multiple dependent claims fee as well as to place the application in better form for examination.

Early action on the merits is respectfully requested.

Respectfully submitted,

JACOBSON, PRICE, HOLMAN & STERN, PLLC

By

  
John G. Holman  
Reg. No. 22,769

400 Seventh Street, N.W.  
Washington, D.C. 20004-2201  
(202) 638-6666

Date: April 19, 2000  
Atty. Docket: P65317US0  
JCH:jrc

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DISPLAY DEVICE

This invention refers to a display device consisting of a sheet-like support, which is covered with liquid thermocromic crystals, which can be tempered by separate power supply to individual heating element, which lie close to the crystals and are placed between the sheet-like support and the crystals, whereby the crystals assume different shades of colour depending on the given temperature so that hereby the colour of the crystals will form a certain pattern.

A display arrangement of now mentioned type is disclosed in e.g. US 4142782. This display includes a sheet-like metallic support, which has a surface, which is covered with a thin layer of a conventional paint. The layer is in turn covered with areas of a certain thermocromic composition and it may also contain areas of different thermocromic composition. It may also contain areas of further different kind of a thermocromic composition and/or mixtures of the earlier mentioned thermocromic compositions. The areas will normally be created by conventional painting techniques using a coating composition containing a thermocromic compound and an appropriate conventional binder and an appropriate solvent. The composition may further include pigments of any colour or the composition can be colourless. The binder is usually colourless in order not to obscure the colour effects to be formed. It is further described in the patent that the heating of the different areas is carried out by plate-like electrical resistance elements, which are placed between the sheet-like support and the areas of the thermocromic positions. These plate-like electrical resistance elements heat the individual crystals in the different areas to a certain temperature so that the crystals in a specific area assume a certain colour depending on the temperature. According to the above described methods certain areas or certain points are given a certain colour by that the thermocromic crystals, above or in the neighbourhood of a certain heating element are heated. Different patterns

will hereby be formed by that the crystals having a certain colour will form a certain pattern. If the display however is subjected to the ambient temperature, one can understand that it may be difficult to control the pattern so it has the  
5 wanted design and it can also be difficult to change the pattern from one design to another if the new pattern demands a lower temperature for the individual crystals than the earlier temperature. The temperature of the sheet-like support is thus of great importance and the sheet-like support may assume the  
10 ambient temperature, which can be so high that the control of the temperature for the individual electrical element have no effect on the crystals but it is only the ambient temperature which has an effect on the crystals.

15 The object of the invention is to increase the possibilities to control the tempering of the individual crystals and also protect them from being effected by the ambient temperature and also from mechanical damage. The produced picture on the display shall also be possible to program.

20 The invention is characterized by the features stated in the following patent claims and a favourable embodiment is described in the following by reference to accompanying drawings.

25 Fig. 1 is thereby a schematic view a display according to the invention.

30 Fig. 2 is a schematic section according to the lines II-II of fig. 1.

Fig. 3 is a section through the underlying sheet-like support.

35 The invention is thus a display device consisting of a stiff sheet-like support 1. The sheet-like support could be made for instance of metal. Several small separately heatable elements 3 are arranged on the sheet-like support and the heating is

performed by supplying an electrical voltage through cables 6 to the elements 3. A layer of liquid thermocromic crystals 2 cover the layer of the heatable elements. The liquid thermocromic crystals may be applied by painting of a coating composition which contains thermocromic crystals, which are bound by a binder. The characteristic of the thermocromic crystals is that they assume a certain colour in correspondence to their given temperature. If thus a heatable element below a crystal is heated to a certain temperature, said crystal will assume said temperature and is coloured if the temperature is higher than the temperature at rest of the crystal. Fig. 1 shows that the crystals 2 have been given a certain temperature so that a letter L has been formed. The letter L appears by that all the crystals along the shape of L have been given the same certain temperature by the underlying heatable element. The thermocromic crystals outside L remain passive because their underlying heatable element have not been heated by voltage supply. As said earlier the power for heating the elements can take place by supplying a current of a certain voltage.

The thermocromic crystals are covered by a coating of lacquer in order to protect the crystals to the surroundings, the composition of said coating of lacquer being stated later.

In order to quickly be able to change the pattern, formed by the crystals, it could be necessary to cool down the crystals, if the crystals must be given a lower temperature than the one they have in order to assume a different colour. This could concern all the crystals or certain crystals. All the crystals shall thus be cooled down and this can be done by that the sheet-like support 1 is cooled down or is kept on a constant temperature which is lower than the temperature which makes the crystals to assume a certain colour. This means that as long as the heatable element are not heated any longer, the whole display device including the thermocromic crystals will be cooled down to the temperature of the sheet-like support.

This is illustrated in fig. 3 by that the sheet-like support has one or several continuous channels or is designed like a jacket so that the sheet-like support is hallow whereby a cooling medium can pass through the sheet-like support and keep it at a constant temperature or lower the temperature for the complete display device.

A further way to carry out the refrigerating capacity is to arrange a layer of peltier elements under the heatable elements. The characteristic of a peltier element is that it very quickly is controlled by means of electrical energy and thus can be given an enough low temperature in order to lower the temperature of the thermocromic crystals under the temperature at which they are given a certain colour. The peltier elements can also be used instead of the heatable elements 3, see fig. 2 whereat thus the heatable elements 3 are peltier elements.

The kind of coating of lacquer which is used consists suitably of an acryl base and synthetic agent and it is specifically suitable that the mixing proportion is 10:1. Such a lacquer is very resistant to wearing and also UV-radiation. The described display device is thus suitable as an advertising sign, because the pattern on the display (figures) can be altered rapidly. The display device is not effected by the ambient temperature because the sheet-like support is kept at a constant temperature. If not, the sunshine could effect the display so that it is not possible to control the pattern which the thermocromic crystals should show. Electrical energy is preferably used, e.g. supply of current of a certain voltage, for heating the heatable elements and the supply of current can be program-controlled concerning the voltage and also which of the heatable elements that should be supplied by power. Thus a computer may be programmed by a certain picture and accordingly controls the signals for the power supply to the heatable elements. The signals of a computer can also be used and possibly amplified in order to bring about the change

of temperature of the underlying means. The computer can also control the refrigeration.

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## CLAIMS

1. Display device consisting of a sheet-like support (1) which is covered with a layer of liquid thermocromic crystals (2), which are separately tempered by individual power supply to individual heatable elements (3), which lie close to the crystals and are placed between the sheet-like support (1) and the crystals (2), whereby the crystals assume different shades of colour dependent on the given temperature so that hereby the colour of the crystals will form a certain pattern and hereby a figure characterized by that the thermocromic crystals (2) are distributed over the complete layer without a specific pattern and that the design of the figure is determined only by tempering the small heatable elements (3), which are located according to said wanted design and by that the support includes cooling means (4) which are controlled to cool down the crystals (2) and/or keep the support (1) of the crystals at a certain temperature, which is lower than the temperature, at which the crystals are coloured and whereat the crystals are covered by a coating of lacquer over the complete sheet-like support.
2. Display device according to claim 1, characterized in that the underlying means consists of peltier elements, which are black and are supplied by electricity in order to set their temperature.
3. Display device according to claim 2, characterized in that the liquid thermocromic crystals are painted on the peltier elements.
4. Display device according to claim 1, characterized in that the coating of lacquer is a plain lacquer and consists of an acryl base and a synthetic agent.

5. Display device according to claim 4, characterized in that the mixing proportion between the acryl base and the synthetic agent is 10:1.
- 5 6. Display device according to claim 1 and 2, characterized in that the peltier elements also are the individual heatable elements (3), which are heated by electricity.

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AMENDED SHEET

## ABSTRACT

A known display device consists of a sheet-like support (1) which is covered with liquid thermochromic crystals (2). These are tempered by individual power supply to individual heatable elements (3), which lie close to the crystals and are placed between the sheet-like support (1) and the crystals (2). The crystals assume different shades of colour dependent on the given temperature so that hereby the colour of the crystals will form a certain pattern. In order to improve the possibilities to control the tempering of the individual crystals and also protect them from being effected by the ambient temperature and from mechanical damage, the crystals have underlying means (4) which are controlled to cool down the crystals (2) and/or keep the sheet-like support (1) of the crystals at a certain temperature.

This temperature is lower than the temperature, at which the crystals are coloured. Further the crystals are covered by a coating of lacquer over the complete sheet-like support.

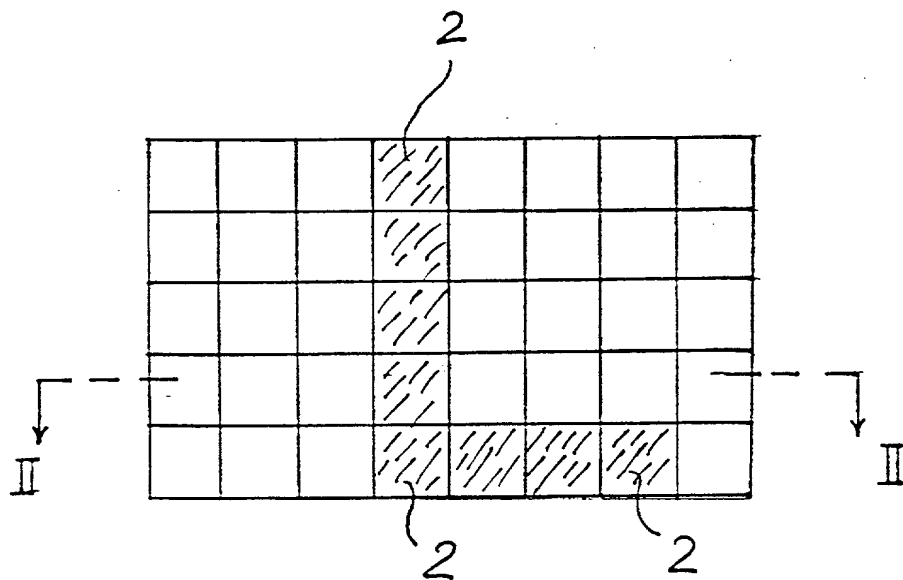


Fig 1

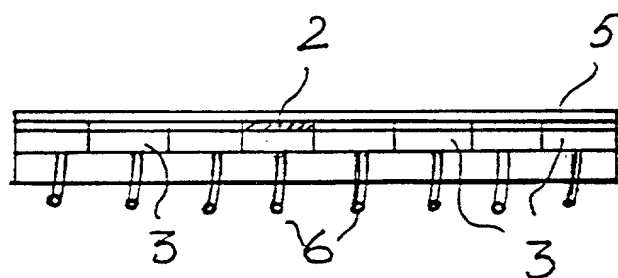


Fig 2

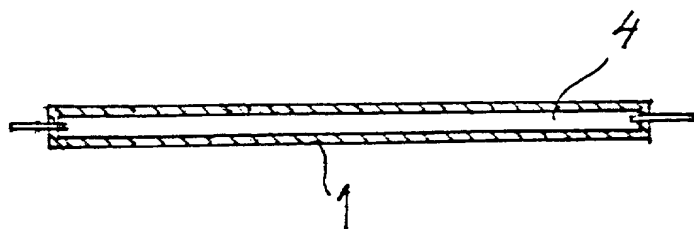


Fig 3

COPY

DECLARATION  
AND POWER OF ATTORNEY  
U.S.A.

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ATTORNEYS' DOCKET NO.

ALL PATENTS, INCLUDING DESIGN  
FOR APPLICATION BASED ON PCT; PARIS CONVENTION;  
NON PRIORITY; OR PROVISIONAL APPLICATIONS

As a below named inventor, I declare that my residence, post office address and citizenship are stated below next to my name. The information given herein is true, that I believe that I am the original, first and sole inventor (if only one name is listed at 201 below), or an original, first and joint inventor (if plural inventors are named below at 201-203, or on additional sheets attached herein) of the subject matter which is claimed and for which patent is sought on the invention entitled:

## DISPLAY DEVICE

which is described and claimed in: ☒ PCT International Application No. PCT/SE98/01906 filed 21 October 1998☐ the attached specification☐ the specification in application Serial No. \_\_\_\_\_

dated \_\_\_\_\_

(if applicable) and amended on \_\_\_\_\_

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

9703851-7  
(Number)Sweden  
(Country)22.10.1997  
(Day/Month/Year Filed)

Priority Claimed

☒ Yes ☐ No

(Number)

(Country)

(Day/Month/Year Filed)

☐ Yes ☐ No

(Number)

(Country)

(Day/Month/Year Filed)

☐ Yes ☐ No

I hereby claim the benefit under Title 35, United States Code, §119(a) of any United States provisional application(s) listed below:

Application No. \_\_\_\_\_

Filing Date \_\_\_\_\_

Application No. \_\_\_\_\_

Filing Date \_\_\_\_\_

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)

(Filing Date)

(Status: patented, pending, abandoned)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys (Registration No.) to prosecute this application, receive and act on instructions from my agent, and transact all business in the Patent and Trademark Office connected therewith. HARVEY B. JACOBSON, JR. (20,851); D. DOUGLAS PRICE (24,514); JOHN CLARKE HOLMAN (22,769); MARVIN R. STERN (20,540); MICHAEL R. SLOBASKY (26,421); JONATHAN L. SCHERER (28, 851); IRWIN M. AISENBERG (19,007); WILLIAM E. PLAYER (31,408)

SEND CORRESPONDENCE TO:

JACOBSON, PRICE, HOLMAN & STERN  
PROFESSIONAL LIMITED LIABILITY COMPANY  
400 Seventh Street, N.W.  
Washington, D.C. 20004

DIRECT TELEPHONE CALLS TO:

(Please use Attorney's Docket No.) (202) 638-6665

JACOBSON, PRICE, HOLMAN & STERN  
PROFESSIONAL LIMITED LIABILITY COMPANY

\*Inventor(s) name must include at least one unabbreviated first or middle name.

201	FULL NAME* OF INVENTOR	FAMILY NAME	GIVEN NAME	MIDDLE NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY
202	FULL NAME* OF INVENTOR	FAMILY NAME	GIVEN NAME	MIDDLE NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY
203	FULL NAME* OF INVENTOR	FAMILY NAME	GIVEN NAME	MIDDLE NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under section 1001 of Title 18 of the United States Code; and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201\*

SIGNATURE OF INVENTOR 202\*

SIGNATURE OF INVENTOR 203\*

DATE

DATE

DATE

☐ Additional inventors are named on separately numbered sheets attached hereto.  
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